Cancer Imaging (2005) **5,** 25–26
DOI: 10.1102/1470-7330.2005.0010

CI

e-med
www.e-med.org.uk

EDITORIAL

Incidental pulmonary embolism detected by routine CT in patients with cancer

A J Paddon

Hull and East Yorkshire Hospitals NHS Trust, Hull, Yorkshire, UK

Corresponding address: Dr A J Paddon, Department of Radiology, Hull Royal Infirmary, Anlaby Road, Hull HU3 2JZ, UK. E-mail: alexander.paddon@hey.nhs.uk

Date accepted for publication 5 April 2005

There is an increased risk of pulmonary embolism (PE) in patients with malignancy. This increased risk is fourfold above the general population and is further increased if the patient is receiving chemotherapy[1–6]. Between 4 and 28% of cancer patients will develop thromboembolic disease depending on their tumour type and stage[1]. A significant proportion of patients with PE will present with non-specific symptoms[7] or will be asymptomatic[8]. Identification of symptomatic suspected PE by CT pulmonary angiograph (CTPA) is well established[6,9]. The analysis of smaller peripheral vessels at CTPA is made possible by thinner collimation[10] which improves the degree of certainty by which CT can detect PE. A 40% improvement in detection of sub-segmental PE is observed by decreasing collimation from 3 to 1 mm when performing dedicated CTPA[11].

While CT scanning for other indications is not primarily aimed at detecting PE, incidental detection of asymptomatic PE has been reported in several series.

Using thick collimation between 5 and 10 mm, Winston[12] found incidental PE in 0.96% of 1879 consecutive patients scanned for a variety of indications including trauma and malignancy evaluation. All of the patients with incidental PE had at least one risk factor. Gosselin[13] found unsuspected PE in 1.5% of 785 patients with 5–8 mm collimation. The majority of the study group had malignancy. The highest risk subgroup was inpatients with malignancy in which 9% of 81 patients had incidental PE. In cancer patients I have observed a 2.5% incidence of asymptomatic PE using 5–8 mm collimation in 364 consecutive scans. Observed rates of incidental PE vary with thinner collimation techniques. Shultz[14] found that 24% of 90 trauma patients had incidental PE using a 1.25 mm collimation technique. Only 4 of these (4.5%) had major clot burden which one might expect to have been visible with thicker collimation. In cancer patients a 2.1% incidental PE rate was observed by Boswell[15] in 2085 patients at 2 mm collimation. Of these, only 9 (0.4%) had saddle emboli or emboli in the right or left pulmonary arteries.

Thus for a thick slice technique of between 5 and 8 mm collimation, one should expect to see incidental PE in between 0.4% and 4.5% of cases.

Cancer patients often undergo multiple CT investigations as part of their cancer staging and treatment monitoring. Review of the pulmonary arterial tree on these examinations will reveal PE in a considerable number. The best method of visualisation is clearly at the workstation using windowing specifically tailored to the pulmonary vascular tree in question. Conventional soft tissue windows often do not show the pulmonary arteries well, as the contrast enhanced blood is too dense when the chest acquisition is made at around 35 s. Such a phenomenon is described for CTPA[9]. I find window settings of approximately width 500, centre 130 to be best but the values are easily optimised for each individual patient at the workstation.

Confident diagnosis of a filling defect at thick slice CT can be difficult with the potential false positives due to partial voluming, movement artefacts and the presence of adjacent lymph nodes[13]. Advice related to interpretation of dedicated CTPA to prevent such pitfalls should be extended to our thicker slice studies. Diagnostic criteria for PE include the requirement to visualise a 'polo mint' or 'railway track' appearance where embolus is surrounded by contrast enhanced blood[16,17] or the

This paper is available online at http://www.cancerimaging.org. In the event of a change in the URL address, please use the DOI provided to locate the paper.

1470-7330/05/010025 + 02

requirement that the filling defect is seen on two or more consecutive slices[11].

It is likely that patients with incidentally detected PE should be treated with anticoagulation if appropriate. Evidence for this can probably only be based on extrapolation from management of symptomatic PE[6].

In conclusion, where thick slice contrast enhanced CT of the chest is employed in the management of any patient, but especially cancer patients, the pulmonary arterial tree should be systematically reviewed for incidental PE. A workstation should be employed to allow optimisation of viewing windows. Application of criteria to avoid overcalling artefacts should be employed. A 'polo mint' or 'railway track' sign should be seen or the defect seen on two or more slices. In high risk patients where the chest is being imaged, it may be worth considering changing acquisition protocols to include a thinner collimation technique through the pulmonary arteries to allow more peripherally placed incidental emboli to be detected.

References

[1] Lee AY, Levine MN. Venous thromboembolism and cancer: risks and outcomes. Circulation 2003; 107: I-17–21.

[2] Anderson FA Jr, Spencer FA. Risk factors for venous thromboembolism. Circulation 2003; 107: I9–16.

[3] Gearhart MM, Luchette FA, Proctor MC *et al*. The risk assessment profile score identifies trauma patients at risk for deep vein thrombosis. Surgery 2000; 128(4): 631–40.

[4] Otten HM, Mathijssen J, ten Cate H *et al*. Symptomatic venous thromboembolism in cancer patients treated with chemotherapy: an underestimated phenomenon. Arch Intern Med 2004; 164: 190–4.

[5] Schulman S, Lindmarker P. Incidence of cancer after prophylaxis with warfarin against recurrent venous thromboembolism. N Engl J Med 2000; 342: 1953–8.

[6] British Thoracic Society Standards of Care Committee Pulmonary Embolism Guideline Development Group. British Thoracic Society guidelines for the management of suspected acute pulmonary embolism. Thorax 2003; 58: 470–83.

[7] Fulkerson WJ, Coleman RE, Ravin CE, Saltzman HA. Diagnosis of pulmonary embolism. Arch Intern Med 1986; 146: 961–7.

[8] Williams JW, Eikman EA, Greenberg S. Asymptomatic pulmonary embolism: a common event in high-risk patient. Ann Surg 1982; 195: 323–7.

[9] Remy-Jardin M, Remy J. Spiral CT angiography of the pulmonary circulation. Radiology 1999; 212: 615–36.

[10] Ghaye B, Szapiro D, Mastora I *et al*. Peripheral pulmonary arteries: how far in the lung does multi-detector row spiral CT allow analysis? Radiology 2001; 219: 629–36.

[11] Schoepf UJ, Holzknecht N, Helmberger TK *et al*. Subsegmental pulmonary emboli: improved detection with thin-collimation multi-detector row spiral CT. Radiology 2002; 222: 483–90.

[12] Winston CB, Wechsler RJ, Salazar AM, Kurtz AB, Spirn PW. Incidental pulmonary emboli detected at helical CT: effect on patient care. Radiology 1996; 201: 23–7.

[13] Gosselin MV, Rubin GD, Leung AN, Huang J, Rizk NW. Unsuspected pulmonary embolism: prospective detection on routine helical CT scans. Radiology 1998; 208: 209–15.

[14] Schultz DJ, Brasel KJ, Washington L *et al*. Incidence of asymptomatic pulmonary embolism in moderately to severely injured trauma patients. J Trauma 2004; 56: 727–33.

[15] Boswell WD, Pierce J, Fahimi A, Parisky Y, Sheth P. Incidental pulmonary emboli detected by multi-detector row spiral CT in cancer patients. Cancer Imaging 2004; 4: S58.

[16] Whittle MA, Hansell DM. The role of spiral computed tomography pulmonary angiography in the investigation of pulmonary embolism. Imaging 1998; 10: 169–78.

[17] Perrier A, Howarth N, Didier D *et al*. Performance of helical computed tomography in unselected outpatients with suspected pulmonary embolism. Ann Intern Med 2001; 135: 88–97.